

Shoreline Protective Structures



*Staff Report to the
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SHORELINE PROTECTIVE STRUCTURES STAFF REPORT TO THE CALIFORNIA STATE LANDS COMMISSION

EXECUTIVE SUMMARY

Approximately 80% of all people in California live within 30 miles of the Pacific Ocean and four million of those live within three miles of the shoreline.¹ Because of this significant population pressure on coastal areas, a great deal of residential, commercial, industrial and public infrastructure development occurs near the shore. Development along and adjacent to the shore often impacts natural shoreline processes. Significant development on top of coastal bluffs has contributed to shoreline armoring to protect those developments from the effects of wave generated erosion.

The most frequently used approach by public agencies and private property owners to shoreline erosion along California's coast has been the placement of protective structures, primarily seawalls or rock revetments. Such structures seem to be the most effective in protecting private property for the most economical cost. However, such structures may also have adverse impacts on the shoreline environment. The major issues related to protective structures include negative environmental effects, such as modifications of landforms and drainage patterns, increased bluff and beach erosion, interference with sand supply and littoral drift, loss of public beach, constraints on public access and potential impacts on flora and fauna as a result of unnatural encroachment of facilities and/or sand onto the beach environment. Regardless, government agencies have been reluctant to deny permits in the face of pending loss of improved upland properties.

One alternative to hard structures being used to address shoreline erosion is beach building/sand replenishment. Sand replenishment projects may help to offset the gradual thinning and disappearance of a region's beaches. Recent studies on the benefits of beach enhancement have indicated that they should be combined with offshore hard structures in the form of sand retention groins.² Beach replenishment has a two-fold benefit for the public in that it provides significant protection from the effects of coastal erosion on inland properties, as well as enhancing sand-starved beach areas. Enhanced beaches benefit the citizenry and the state's tourist industry with expanded recreational areas, which is of significant importance to the overall economic health of California.

In most areas of California the primary natural source for the region's beaches is sediment carried from inland areas by rivers and streams. Dams reduce the amount of fresh water flows to coastal wetlands, reduce the size of flood flows and thus reduce the flushing of sediment from inland sites through coastal estuaries. Dams trap the sand that would normally nourish the coastal beaches, which can ultimately become the primary buffer for protection of seacliffs and shoreline development from erosion and storm damage.

The California State Lands Commission (CSLC) has jurisdiction over all ungranted tidelands and submerged lands within the state. The shoreline boundary of the state's ownership of the Pacific Ocean and adjacent bays and estuaries, as well as other tidal waterways is generally a moving boundary identified as the Ordinary High Water Mark (Civil Code sections 670 and 830). Along most of California's shoreline there is uncertainty as to the exact location of that boundary. In instances where the shoreline is no longer in a state of nature the boundary may be fixed by adjudication or agreement. Only 1±% of the state's sovereign land boundaries have been permanently fixed in this manner. The law of moving boundaries along waterways often leads to considerable confusion over ownership and jurisdictional issues. What one day is public land, the next may be private and vice versa. The costs associated with determining the boundary at any given location may involve months to years of study and may reach thousands of dollars. This can be a substantial burden for private citizens or public entities seeking a determination of the boundary.

The CSLC has the discretion to waive rent for protective structure leases issued to private parties and public agencies when it is determined that a public benefit accrues therefrom. The original concept of public benefit consideration stems from inland waterways where Reclamation Districts and property owners, along the banks of rivers and streams, sought authority to protect river levees from erosion and prevent flooding of adjacent lands. For at least the last two decades, the CSLC and its staff

have determined that although the protective structures, primarily rock riprap bank protection, did have a direct benefit to the adjoining owner, they also had an indirect benefit of providing protection for public roads, highways and utilities, and to public waterways which serve to transport fresh water to federal and state water projects.

In coastal areas, other arguments provide support for rent-free public benefit leases. Protective structures, particularly in areas open to the public, protect the base of eroding coastal bluffs, and provide safety to the public by reducing the potential of bluff collapse. The CSLC's regulations provide that if rent is charged it is to be based on nine percent of appraised land value. Given the high land values of coastal properties in Southern California, typical annual rents for protective structures could range from \$1,000 - \$4,000, or more. Some private parties may choose to challenge the CSLC's jurisdiction rather than pay rent for property they believe they own. The costs of such litigation can be extremely high, with both the state and the private property owners bearing the burden.

Various federal, state and local government agencies have authority to regulate and permit protective structures and beach enhancement projects. These agencies can more easily and comprehensively regulate shoreline protection because, unlike the CSLC, their jurisdiction extends well inland of the Ordinary High Water Mark. Along with the CSLC, these agencies are balancing the rights of private property owners with the rights of the public in permitting protective structures, when and where necessary. The approval of such structures is generally conditioned to provide for minimal beach encroachment, protection of the environment, maintenance of public access, and in some areas, mitigation for loss of beach sand supply.

There are very few alternatives available to public entities for solving erosion problems. Public entities can either allow armoring of eroding beaches, fund soft-structure beach enhancement to protect eroding shorelines or, as a last alternative, provide for the normal retreat of the shoreline by purchase or relocation of existing improvements or through zoning restrictions. If private property owners are not allowed to build protective structures to protect their private property, then ultimately and eventually governmental entities may be required to do so to protect the public infrastructure that would be placed at risk if the coastal bluffs are allowed to erode unheeded.

This report will discuss the various types of protective structures, the responsibilities of the federal, state and local governments, the role and current practices of the CSLC, and alternatives for the CSLC to consider in determining whether to continue its current practice.

BACKGROUND

This report has been prepared to address concerns expressed by members of the California State Lands Commission (CSLC) at the Commission meeting held on November 27, 2000. Commissioners asked specific questions regarding the current policies of the Commission with respect to issuance of leases for the construction and maintenance of protective structures, primarily along coastal areas of the state. Specifically the Commissioners expressed concerns regarding whether it was appropriate for the CSLC to continue issuing protective structure leases that did not require the payment of rent. Commissioners expressed additional concern as to whether the placement of hard protective structures negatively impacts beach sand supply, or causes additional erosion thereby reducing beaches available for public use.

Approximately 86% of the coastline of California is under active erosion.³ The extent and rate of erosion varies depending on the location and the physical characteristics of the coastline. Most experts on coastal processes in California agree that the constant process of erosion and accretion is not necessarily equated with loss of beaches. Under the normal process of erosion and bluff retreat, the beach itself remains relatively stable in size and depth but progresses inland as the bluff or shoreline erodes. Beaches along an eroding coast, if unaltered by human activity, simply migrate landward naturally. Shoreline retreat may vary from a few inches to a few feet a year and sometimes more during severe weather conditions, such as El Niño events.⁴ The projected rise in sea level may in the long term also play a major role in shoreline retreat. Partly offsetting the effects of sea level rise is the upward movement of the North American Plate. However, the current offset is unlikely to eliminate the effect of sea level rise in submerging beaches.



Example of undercutting in sandstone bluffs near Stone Steps in Encinitas.

Depending on the location along the California coast, generally it is agreed that 75-95% of all beach sand is or was provided by rivers that empty onto the coastal plains.⁵ Human actions, however, have had a major impact on the ability of rivers to deliver sand, thus affecting the shoreline. Activities that have hindered or eliminated natural sediment transport by rivers and streams include reservoir dam building, flood control systems, sand mining, and covering of natural landscape with pavement and structures. Dams reduce the amount of fresh water flows to coastal beaches and wetlands, where reduced flood flows prevent the flushing of sediment from inland sites through estuaries and onto coastal beaches. Dams trap sand that would

normally nourish the coastal beaches that would otherwise become the primary natural buffer acting as protection for seacliffs and coastal development from erosion and storm damage.

Approximately 80% of all people in California live within 30 miles of the Pacific Ocean and four million of those live within three miles of the shoreline. Because of this significant population pressure on coastal areas, a great deal of residential, commercial, industrial and public infrastructure development occurs near the shore.

Development along and adjacent to the shore often impacts the natural shoreline processes. Significant development on top of coastal bluffs has contributed to the need for shoreline armoring in order to protect those developments from the effects of erosion. Erosion of coastal bluffs is caused by two primary actions: 1) wave energy impacts that erode the base of the bluff, sometimes causing seacliffs and undercutting to develop; and 2) bluff top activities (domestic landscaping) that increase subsurface water percolation into the bluff resulting in loosening of the upper bluff materials and sloughing. The construction of residential and commercial buildings and the paving of roads and surface areas associated with construction has concentrated rainwater and domestic water runoff onto relatively small surface areas resulting in exacerbation of this second cause of bluff collapse.

Although most construction projects may have a negative impact on normal shoreline processes, some have resulted in expanded sand beaches. Restoration of coastal lagoons, such as at Batiquitos Lagoon in San Diego County, have provided significant sandy materials for deposit on and enhancement of existing beaches. Under study are several projects which will result in the removal of historic dams (Rindge and Matilija Dams) on Southern California watersheds (Malibu Creek and Ventura River, respectively) that will return those watersheds to a more natural regime, thereby allowing significant sediment to be transported naturally from inland sources to the beach.

The California Environmental Quality Act (CEQA) plays a role in addressing beach erosion issues. CEQA issue areas that should be analyzed when a proposal involves construction of protective structures and/or beach replenishment projects include, but may not be limited to, impacts on biological resources, noise, land use planning, geology and soils, transportation, aesthetics, recreation and tourism, commercial and recreational fishing, human health and public safety, cultural and paleontological resources, hydrology / water quality, air quality, natural resources, public services, and energy.

ALTERNATIVE METHODS FOR ADDRESSING SHORELINE EROSION

There are three principle methods used in California to address shoreline erosion. They are shoreline protection devices, beach replenishment, and land use planning.

Hard Structures

The most frequently used approach by public agencies and private property owners to shoreline erosion along California's coast has been the placement of protective structures, primarily seawalls or rock revetments. These structures are used to help slow down bluff erosion and prevent future